



Near Erfoud/Morocco, January 2012

MARS2013

Announcement of Opportunity Morocco Mars Analog Field Simulation



Between 01 - 28. February 2013, the Austrian Space Forum will conduct an integrated Mars analog field simulation in the northern Sahara near Erfoud, Morocco in the framework of the PolAres research programme. Directed by a Mission Support Center in Austria, a small field crew will conduct experiments preparing for future human Mars missions mainly in the fields of engineering, planetary surface operations, astrobiology, geophysics/geology, life sciences and other. This field mission is supported by the Ibn-Battuta-Center at the University of Marrakesh, Morocco.

The Austrian Space Forum now solicitates proposals to be reviewed by a selection panel. The deadline for submissions is 15. June 2012, the announcement of the successful experiments will be released on 15. July 2012.



1. Field mission aims

In the framework of the PolAres¹ research programme of the Austrian Space Forum, the MARS2013 Mars analog field campaign will further the preparation of future human Mars missions by testing scientific instruments, concepts for human-robotic partnerships and engineering and operations trials.

Conducting field research in a representative environment is an excellent tool to gain operational experience and understand the advantages and limitations of remote science operations on other planetary bodies. The area near Erfoud is considered as a relevant proxy for various types of geological features of Mars, as well as a diversity of paleo(micro)biological signatures, terrain topographies similar to the Martian deserts and a test site area size which requires a diligent exploration mission design. This field mission is designed to be

- **an opportunity to study equipment behavior involving the simultaneous usage of instruments with the option of a human-in-the-loop (via the Aouda.X spacesuit),**
- **a platform for testing life-detection or geophysical techniques, performing terrain tests for rovers and test concepts for high situational awareness of remote support teams,**
- **studying the northern Sahara as a model region for Martian deserts and extreme life,**
- **serving as an outreach platform to enhance the visibility of planetary sciences**

2. MARS2013 candidate sites

East of the Atlas mountain range, the Erfoud region offers several potential test sites which have been characterized during a field reconnaissance trip in January 2012. The regional geology offers a wide range of features such as dry river beds and deltas including evaporites, dunes, sandstones, (altered) basaltic rocks, shales (mostly from the Devonian and Silurian ages including fossil records) and other geomorphological features.

Environmental conditions expected are humid (30% (daytime) -90% (night time) r.H.) and moderately warm (typically between 5 - 20°C in the shade, 40°C in direct sunlight). Detailed on-site pressure, humidity and temperature profiles are available on request based upon a scouting field reconnaissance in late January 2012. The test sites coordinates are located around N 31°20' W 004°00' and N 30°50' W 003°50' at altitudes between 700-1000 m a.s.l..

The next major city is Erfoud, typically between 30 min to 2 hrs of driving from the test sites. The nearest international airport is Marrakech, about 8 hrs driving across the Atlas mountains.

No significant environmental safety or security risk has been identified.

¹ **PolAres is an interdisciplinary research programme of the Austrian Space Forum preparing exploration strategies for a human-robotic Mars expedition with a focus on planetary protection.** After a scouting phase looking for appropriate Mars-analog test sites, a rover and a spacesuit simulator including the support infrastructure are optimized for joint operations whilst maintaining planetary protection measures.

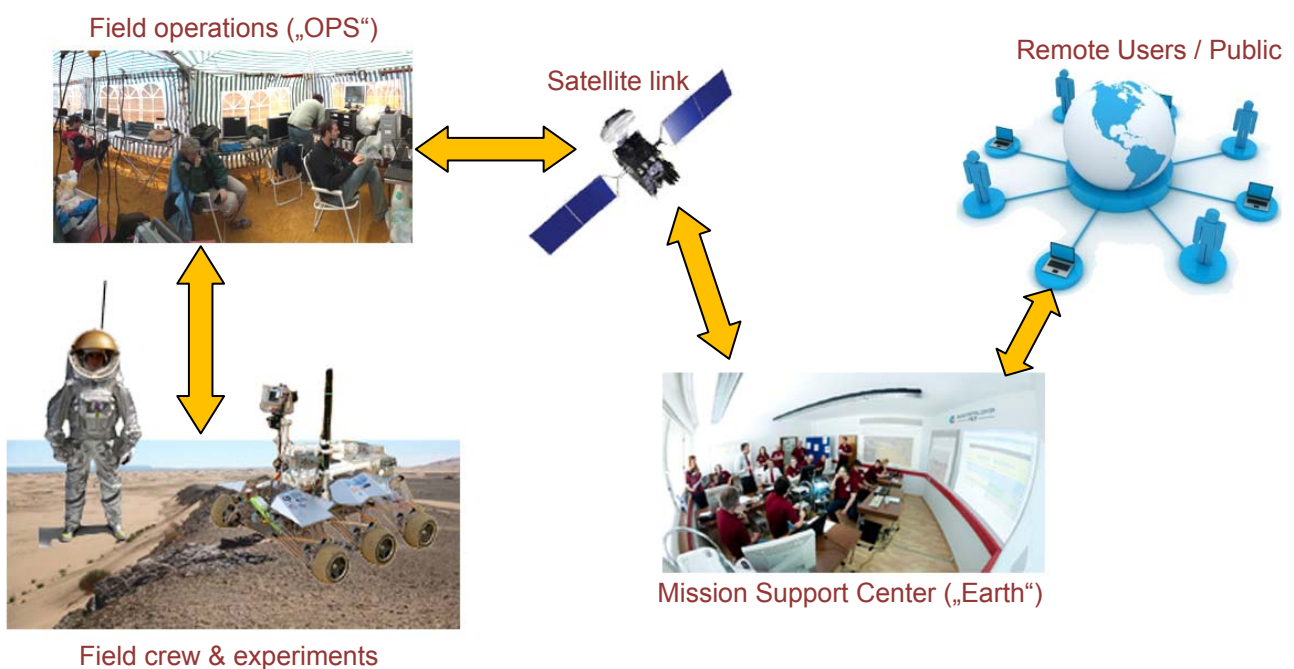
PolAres is designed to **develop** hardware and operational requirements for future human-robotic missions to Mars including near-real time decision making procedures for field exploration, **study** contamination issues in planetary exploration, its hardware elements like the rover and the spacesuit simulator serve as a testbed for instruments in a realistic setting, and **engage** the general public in space exploration.

3. Examples for expected terrain morphologies



4. Baseline design of the MARS2013 field simulation

Based upon previous high-fidelity Mars analog mission simulations, the Austrian Space Forum has established a field campaign infrastructure and roadmaps implemented during MARS2013. The mission architecture is given in the figure below. All field activities will be scheduled through a “flight plan”, which is established by the Mission Support Center depending on requests and resources available.



The actual field mission will take place in February 2013. To allow for a timely shipping, all experimental hardware must leave Innsbruck in early January 2013. In parallel the Mission Support team and field crew training takes place.

Week 1: Preparatory phase

The first week will be for acclimatization and establishing an operational base camp – this period also offers an opportunity for guest researchers to be at the Mars analog sites as well as be available for media activities. Instruments which cannot be operated by the OeWF field crew (e.g. due to the experiment sensitivity, operator training requirements etc...) can be used by the research teams themselves in the field. Selected pilot & calibration measurements will be conducted.



Field crew: Experimenters who wish to be on-site in person (slots limited by base camp infrastructure), OeWF field crew, media, selected observers.

Week 2-4: Research phase

The following three weeks, the Mission Support Center in Innsbruck/Austria will direct a field team strictly limited to 10-12 crewmembers who will conduct experiments according to a flight plan. Field data will be analyzed in near-realtime by the remote science team which receives a telemetry stream via satellite. The infrastructure on-site will also include power, mobility, basic accommodation/catering and safety, access to a small workshop (e.g. with 3d rapid prototyping) and the Aouda.X spacesuit simulator. An optional time-delay simulating the signal travelling time between Earth and Mars can be introduced.

Field crew: 12 [OeWF crew (10 people), 1-2 external researchers (on a case-to-case bases)]

During both phases, the following infrastructure will be available:

- General logistics (accommodation in tents, water/food/medical care, very basic hygiene)
- Broadband internet access (via Satellite) and 230V/50Hz electrical power
- A basic mechanical and electrical workshop (including 3d-Printer)
- Basic mobility (Off-road vehicles, Quad-Bikes)
- Remote support team (Mission Support Center, Innsbruck/Austria)

Flight planning roadmap / Blinding of flight planners and remote science teams

To increase the simulation fidelity, the sequence of instrument measurements, deciding on which areas to explore when etc will be done by the Mission Support Center in coordination with the PIs. The OeWF suggests, that most of the science teams will not have the ground-truth available as after the field reconnaissance or literature ("blinding") and proceed as it would be the case on Mars, where only limited remote sensing and robotic precursor data are available ("exploration cascade": orbital remote sensing → aerial reconnaissance → robotic precursors → human surface expedition with increasing instrument and mobility capabilities.).

5. Timeline & Selection process

	Announcement of Opportunity / Second announcement
15. June 2012	Deadline for experiment proposal submissions
15. July 2012	Notification of Acceptance/Non-Acceptance
Early October 2012	Experiments defined in detail, preliminary mission definition, release of Mission Manifest (= the main expedition planning reference document)
December 2012 - Early January 2013	hardware arrives in Innsbruck, field team training, shipping to Morocco/customs clearances
Februar 2013	Field mission
March 2013	return of hardware to Innsbruck, shipping back to home institutions, debriefings
May 2013	Mars Analog Field Mission Science & Technology Workshop (Innsbruck/Austria, <i>tbd</i>)

Selection process

Submissions MUST reach the Austrian Space Forum PolAres Programme office by

15. June 2012, 23:59 CEST via Email (info@oewf.org, cc: gernot.groemer@oewf.org).

All experiments will undergo to a peer-review process to ensure a high quality of research. They will also have to be self-funded, but the scientific and logistics infrastructure will be provided by the Austrian Space Forum. Also, the option for purely remote-science operated experiments is possible.

The selection board consists of a small group of senior researchers in the field of geosciences, astrobiology, human factors research and robotics engineering; if necessary, additional fields will be covered by appointed reviewers on an ad-hoc basis.

The selection will be based upon to main criteria

- Scientific merit, including the potential for data fusion with other experiments and alignment with the aims of the PolAres research programme. This criterion includes the ability to carry out a well structured and scientifically sound research project.
- Logistics resources, engineering and safety risks ("*Can it work reliably and safe?*")



Depending on the outcome of the selection board recommendations, experiments will either be selected “*as is*”, “*with a request for modifications*” (where the Principal Investigator has still the option to decline), or “*not selected*”. The selection will be announced on 15. July 2012.

Acknowledging the short timeframe for making financing proposals to national funding institutions, experiments can also submit with “*subject to funding decisions*”. In that case, the final decision on the PI-side has to be provided by 01. October 2012 latest to give enough time for the flight planning.

6. Media & Education activities, financial aspects

Media & Education activities

The Austrian Space Forum has a tradition of implementing a “Junior Researchers” programme during science missions. For Mars2103 that means, that also students on a high school level may submit small research projects – their experiments shall also undergo the life-cycle of an experiment from design, instrument development, measurements to data analysis. (The review process will be done independently from the professional selection).

We do expect a major media attention for the mission, as it was the case in previous simulations. The Austrian Space Forum will coordinate and manage all media activities under its lead in cooperation with institutional media offices to ensure a professional and homogenous media effort.

Financial aspects

Experiments have to be self-funded, that includes

- the development of the hardware, including documentation
- transportation of hardware to/from Innsbruck/Austria,
- transportation of personnel to/from Innsbruck and/or Marrakesh/Morocco. (Flights from Europe (Paris, London) to Marrakesh are available for 300-1500 €.)
- experiment specific costs: insurances, packing material etc...

In order to share the costs of the field activities, the expenses for infrastructure and consumables will be distributed amongst the experiments. We estimate the cost of a single person in the field to be roughly 300 - 500 €/week. No costs other than accommodation/food/travel shall arise for participation on a virtual basis or at the Mission Support Center.



Hardware Shipping:

All experimental hardware will have to be delivered to Innsbruck/Austria by the end of December 2012. Experiments will have to cover the shipment costs to and from Innsbruck, but not to Morocco.

The Austrian Space Forum, in partnership with the Ibn-Battuta Center, will organize the shipping between Innsbruck/Austria and the test site in Morocco and provide the infrastructure described in section 3.

In summary, by submitting a proposal, you agree to...

- ...fulfill the requirements put forward in this Announcement of Opportunity, including deadlines, documentation, etc.
- ...be available during the mission for remote science support, either at your home institution or in the Mission Support Center.
- ... potentially share data for data fusion and joint experiments on a case-to-case base.
- ...be able to cover the funding for your experiment to a sufficient level, to deliver the experiment hardware in time to and from Innsbruck/Austria including its documentation and customs clearances.
- ...participate in the preparatory teleconferences and training workshops as necessary (either virtually or in person) as well as in the post-simulation science workshop, to be held in May 2013 in Innsbruck/Austria. (2-3 days, tbd)

If you have any questions, please contact

Austrian Space Forum / PolAres Programme Office

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7. Submission format

Proposal content must conform to the guidelines set forth in this AO and must include:

Titel	An informative title such that by reading the title a person should understand the goal of the proposed investigation; plus a one-word name or acronym for the proposal.	Cover Page
Summary	A summary of the proposal's scientific objectives and the means to address them.	≤ 1 page
Coordinates	The detailed coordinates of every member in the proposing team (name, affiliation, postal address, email, telephone(s)). There is no limit on the number of Co-Investigators that may take part in a proposal.	
Expertise	A brief outline of the expertise that each investigator will contribute to the proposed investigation.	one short paragraph per person
Technical description	The proposed investigation's scientific and technical description, including heritage and maturity, as applicable. Indicate, if you would need to be present in the field or the Mission Support Center or remotely from your institution.	≤ 3 pages
Implementation	<p>The proposed investigation's implementation, management, collaboration arrangements, work breakdown structure, and basis for estimate.</p> <p>This part shall include information about:</p> <ul style="list-style-type: none">• Duration of experiment in the field (e.g. 10 x 2 hrs total):• Suit tester time requested (actual test time):• Power requirements (if >100 W: e.g. how much power for how long/day):• Communication (if >500 kB/s: for how long/day?):• Storage/shipment sizes & weights• Do you have any other special needs? (e.g. legal/IPR issues, special needs of team members, etc...)	≤ 4 pages

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